484). With reference to blocks **485** and **486**, the manner in which time clock generator output signals are used to control the pump will now be described. During operation of the pump, three nearly simultaneous sub-routines occur corresponding to each of the three time clock generators. The first sub-routine begins when the container is loaded and the binary enable switch, e.g., the magnetic read switch, is closed. This begins the generation of pulses by the TCG **1** which are loaded as binary numbers to the CPU bus **425**. When the microprocessor instructs the impeller to begin rotating, e.g., controls the application of current to the electromagnet windings **164**, a second enable signal is generated. The upper magnetic disk **202** is constructed to have a raised area **203** on its outer edge which corresponds to a lever **443** operating a switch **445** connected to TCG **2**. This switch turns TCG **2** on for certain specified time periods from which output signals are derived corresponding to the amount of time it takes the raised area **203** of the upper magnetic disk to complete one revolution and pass the switch. If the pre-programmed schedule of output signals for the TCG **2** is not maintained, that is, the speed of TCG **2** measured in revolutions per minute (RPM) is different from the RPMs established by TCG **1**, then the impeller may have encountered drag that is greater than the pre-determined drag coefficient loaded by the software into the memory device **432**. Alternatively, the pressure in the pump chamber may be too low. In either case, the microprocessor responds by instructing the load interrupt generator to generate an interrupt signal on the CPU bus. The microprocessor responds to the interrupt signal by jumping to an appropriate subroutine for adjusting the angle of the correction plates **166** with respect to the impeller **168**.

In a similar manner, a mastic flow rate detected at the dispensing head using TCG **3** is monitored and compared with a pre-programmed flow rate stored in the memory device **432**. The flow of mastic through the dispensing head is monitored using a pressure-type analog instrument such as the spring loaded pressure switches **390**. The degree to which the mastic moves each of these analog pressure switches **390** is translated into binary codes corresponding to the rate at which pulses are generated by the TCG **3** and transmitted on the CPU bus **425**. If the mastic flow rate detected by either switch differs from the rate stored in the memory device **432**, the microprocessor instructs the load interrupt generator to generate an interrupt signal in the CPU bus. The microprocessor in turn jumps to an appropriate subroutine to increase or decrease the impeller rotational speed via amount of current provided to the electromagnets **164**.

When insufficient or excessive drag or flow rate is detected, the microprocessor is programmed to use the clock **418** to create a maximum correction period counter. The counter is initialized with a value representing a period of time during which corrections can be attempted. The length of the period depends on the type of mastic or compound being pumped. The counter is decremented (block **488**). If data from TCG **2** indicates that the impeller is experiencing an incorrect amount of drag, the microprocessor controls the application of current to the microstep motor **318** in order to vary the positions of the correction plates **166** by spinning the ring gear **292** and the outside spur gears **268** (blocks **490** and **492**). The microprocessor therefore has a wide range of timing abilities to compensate for the overall pumping requirements of various heavy liquids. If the pressure switch **390** at the dispensing head and the output data of TCG **3** indicate that the flow of liquid is too slow or too fast as compared with a predetermined stored value, the microprocessor controls the amount of current supplied to the windings of electromagnets **164** in order to increase or decrease the speed of the impeller to correspond with a predefined timing spectrum using TCG **1** and TCG **2** output signals (blocks **494** and **496**).

With reference to blocks **498** and **500**, if these corrective measures do not cause the output signals from the second and third TCGs to correspond to pre-programmed values within the maximum correction period, the system is malfunctioning. For example, a solid coagulant within the mastic may have become lodged in the pump cavity, causing a significant decrease in mastic flow. The pump may need to be reversed, or powered down and at least partially dismantled, to dislodge the coagulant.

If the system is not malfunctioning, the connection period counter is reset (block **502**). When the system malfunctions, the microprocessor disables receipt of interrupt signals on the CPU bus **425**, as indicated in block **504**. The microprocessor resets the TCG **1** (block **506**) and begins to address the microstep motor **318**, as indicated in block **508**. If a solid was lodged in the impeller, the TCG **2** may have earlier acted to push the correction plates **166** closer to the impeller **168**. The microprocessor controls the motor **318** to stop the process of increasing the angle of the correction plates because application of greater pressure will not fix the problem.

With reference to block **510**, the microprocessor sets the value of TCG **3** to a new correction duration value when a malfunction has occurred. As described in accordance with blocks **498** and **500**, the microstep motor **318** is operated to adjust the correction plates until the maximum correction duration period has ended. The motor is turned off at that point due to a malfunction, as indicated in block **520**. The program control loop described in connection with blocks **512**, **514**, **516**, **518** and **520** is designed to temporarily defeat the normal operation of TCG **3** at the head because application head pressure can drop a cavity, for example, in the mastic, even though pressure through the pump chamber is normal. Thus, operation of impeller speed correction is overridden, i.e., the microstep motor is turned on (block **512**) for corrective measures to be made (block **514**), but the TCG **3** value is preset for a period of time defined by a TCG **3** correction duration counter (blocks **516** and **518**). Accordingly, the TCG **3** is prevented from sending interrupt signals indicating that the impeller speed should be increased when adjustment is not required. The microstep motor is then turned off (block **520**).

With reference to blocks **522**, **524**, **526**, **528** and **530**, a programmed control loop is defined wherein the microprocessor continuously samples all of the sensors, i.e., the output signals of the three TCGs (block **528**). This sampling continues during a time period defined by the TCG **3** correction duration counter (blocks **522** and **524**), which is decremented (block **526**). So long as this counter is non-zero, the microprocessor again enters the loop characterized by blocks **524**–**528** to ensure that malfunctions are detected in the event that the pressure sensor **390**, one of the TCGs or the switch **445** malfunctions, and the microprocessor does not discover it and make corrections. When the maximum correction period counter reaches zero, the values of the TCG units are reset to the initial values discussed above in connection with block **468**. The microprocessor timer interrupt is once again enabled (block **472**) in order to receive interrupt signals from the TCGs and determine when corrective measures are necessary (block **486**).

While advantageous embodiments have been selected to illustrate the invention, it will be readily understood by those